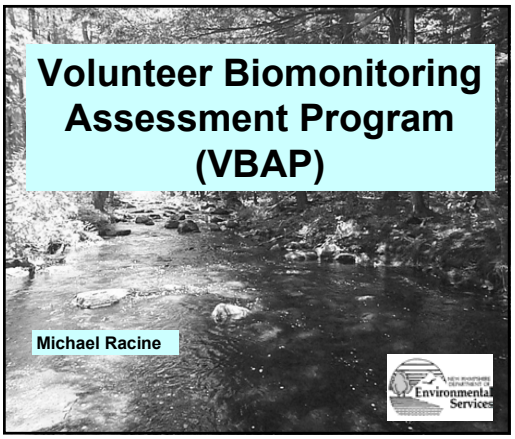
Volunteer Biomonitoring Assessment Program (VBAP)



Michael Racine

Presentation Outline

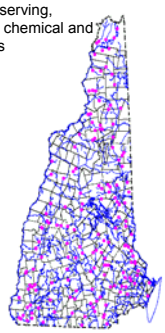
2003 RIVERS AND WATERSHED CONFERENCE

- Introduction
- Protocols
- Progress Report of Current Efforts
- Summary

NHDES Biomonitoring Program An Overview

Goal of Federal Clean Water Act: Preserving, maintaining, and restoring the physical, chemical and biological integrity of our nation's waters

- Originally Established in 1994
- Collection Efforts –fish, macroinvertebrates, chemistry, physical habitat
- Goal of establishing numeric biological criteria for assessing biological condition of NH's wadable streams (mostly 2nd to 4th order)
- Currently have narrative standard in place
- To date approximately 250 sites have been sampled



Concept of Biocriteria

- Similar to establishing water quality standards
- Designed to establish "cutoffs" for acceptable and unacceptable ecological community status
- "Status" includes composition, abundance, diversity, structure of fish and macroinvertebrates
- Allows for comprehensive means of assessing and reporting water quality by integrating impacts caused by multiple physical/chemical parameters
- Includes surveys of multiple assemblages (i.e. fish & bugs)

Current State level Volunteer Water Quality Monitoring Opportunities

Volunteer Lake Assessment Program	**Volunteer River Assessment Program**
(VLAP)	**(VRAP)**

- Standardized Data Collection Protocols
- Mostly based on physical / chemical parameters
- Data used in State Assessments

Forthcoming State level Volunteer Water Quality Monitoring Opportunities

Volunteer Biomonitoring Assessment Program

(VBLAP)

Created to fulfill gap in biological data collection in a standardized manner.

Goals:

- **To supplement biological data collected by NHDES staff as a rapid "screening" level technique" (i.e. assessments at "gross" level)**
- **To educate the public about water quality issues as interpreted through biological assessments.**
- **To build a constituency of citizens to practice sound water quality management at a local level and build public support for water quality protection.**

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Protocol Development

Need to be a **Realistic Balance** of the following:

Staff Resources
- •Train Volunteers
- •Validate Protocols
- •Determine Data Usage

Data Usage
- •Screening tool
- •State Assessments
- •Trend Monitoring

Volunteer Abilities
- •Attend Training Workshops
- •Bug Identification
- •Bug Sorting
- •Complete Sampling with limited Equipment

Protocol Development

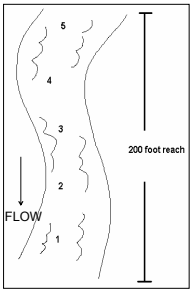
Two Major Concerns in Developing the Protocols

1. **Identification level:** Primarily Order (K, P, C, O, F, G, S)
   - Since we wanted to be able to make **multiple assessments in one day**, protocols needed to be completed in the **field**
   - Field ID to lower than **Order** (with few exceptions) is not possible without a microscope

2. **Identification procedure:** Streamside, Quantitative 100 organism sub-sample
   - •Streamside vs. Laboratory
     - •$ for microscopes
     - •Increased Staff Time:
       - •Training to Family ID
       - •Oversight in laboratory
   - •Qualitative vs. Quantitative
     - •Decided against relative abundances (rare, common, abundant) & decided on actual counts.
     - •Why? To obtain higher quality data.
     - •Is it possible to do actual counts Streamside? Hmmm… It is tough, which is why we have modified protocols (as seen later – person hours)

Protocol Details: Bug collection

Perform 5 1-minute Kicknets over 200' reach to collect bugs

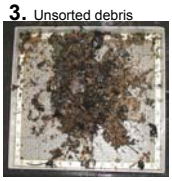


Protocol Details: Bug collection cont…

Protocol Details: Sub sample

2. Empty contents of net

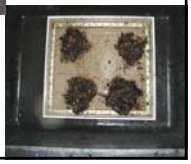
3. Unsorted debris



1. Collect sample

4. Stir debris

5. Clump debris



Protocol Details: Sub sample cont…

Protocol Details: Picking bugs

Picking effort:

Aim for minimum 100 organism sub-sample

Protocol Details: Identify & Enumerate

- Goal is to identify at least 100 bugs
- Pictorial and dichotomous ID keys were provided
- All bugs are returned to the stream at completion of sampling

Ephemeroptera	Mayfly Nymph
Plecoptera	Stonefly Nymph
Trichoptera	Net-Spinning Caddisfly Larvae
	Casebuilder/Freeliving Caddisfly Larvae
Odonata	Dragonfly Nymph
	Damselfly Nymph
Diptera	Black fly larvae
	Midge larvae
	Most True Flies
Megaloptera	Alderfly
	Fishfly or Helgrammite
Coleoptera	Riffle Beetle
	Water Penny
	Other Beetle Larvae
Others	Crayfish
	Snails
	Aquatic Worms
	Scuds
	Sowbugs
	Clams

Protocol Details: Calculation of the Biotic Index

Snails	7	*	0	=	0
Aquatic Worms	8	*	2	=	16
Scuds	8	*	0	=	0
Sowbugs	7	*	0	=	0
Clams	8	*	0	=	0

Total Biotic Score 436

Final Biotic Score = Total Biotic Score / Total # Individuals Counted for all Groups

Final Biotic Score = 436 / 115 = 3.8

Circle the Water Quality Score that corresponds to the Final Biotic Score.

Water Quality Score	
0 - 3.5	Excellent
>3.5 - 4.8	Good
>4.8	Fairly Poor

This is your Biological Water Quality Score
Enter this Score on the Site Sheet.

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- Introduction
- Protocols
- *Progress Report of Current Efforts*
  - *Volunteer Training*
  - *NHDES testing*
- Summary

Volunteer Training: Laboratory Portion

Volunteer Training: Field Portion

..under intense scrutiny of the chiefs

Volunteer Results Summer 2003

Volunteer Group	Site	Town	# Bugs ID'd	WQ Score
Colby-Sawyer	A - Cold River	Walpole	225	Fairly Poor
	B - Cold River	Alstead	51	Excellent
	C - Cold River	South Acworth	181	Excellent
Cold River (LAC)	A - Cold River	Walpole	392	Good
	B - Cold River	Alstead	189	Good
	C - Cold River	South Acworth	110	Good
	D - Cold River	Acworth	159	Excellent
	D - Cold River (duplicate)	Acworth	164	Excellent
Souhegan Watershed Association	Souhegan River	Greenville	146	Good
	Souhegan River	Merrimack	146	Excellent

Volunteer Feedback

Concerns:

- Bug identifications (need for reference collections)
- Time requirement (biggest concern)
- Data:
  - What is Protocol's Utility?
  - Submittal and Retrieval (i.e. What happens to our data?)

NHDES Testing

- Why?
  - Because we presented Protocols to Volunteer groups without having used them
    - What Protocol tweaking needed to be made?
    - Were protocols feasible?
    - What sort of data would they provide?
- What did we do?
  - General Protocol Assessment – user friendly?
  - Quality Control checks
    - Identification success
    - Sorting success

NHDES Testing

# sites sampled	**10**
# bugs ID'd per sample	**152-266**
# staff per site	**2-3**
average sampling time	**2 hrs**
person hours per site (bug collection, sorting, ID)	**5 hrs**
*** average QC time per sample**	**8 hrs**
total hours required to complete one site field sampling & laboratory QC	**12.5**

* This laboratory QC effort is not required of the Volunteers

NHDES Testing: Quality Control Checks

Purpose: to test Field Sorting & Identification efficiency

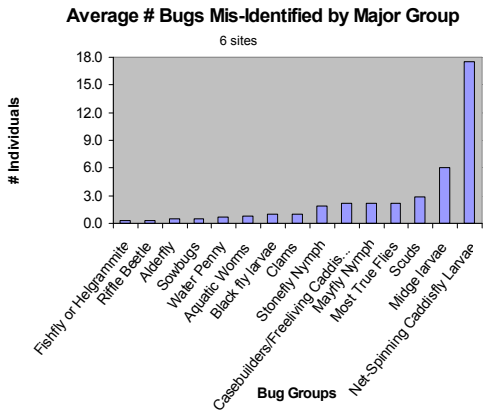
Field Assessment vs.. **Laboratory Assessment**

Same Sample. Different Result?

NHDES Testing: Quality Control Checks – Step 1

- In the Field Bugs were Identified without a microscope
- We brought these bugs back to the laboratory for re-Identification

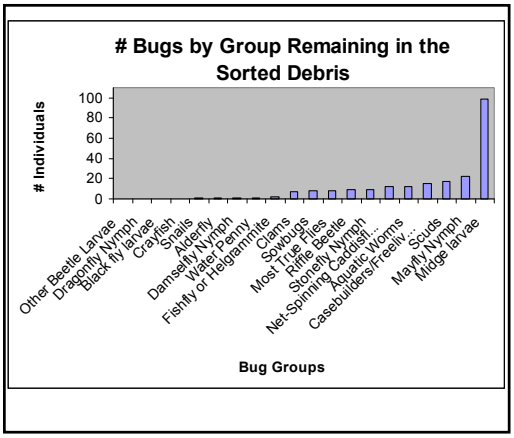
How did we do?



NHDES Testing: Quality Control Checks – Step 2

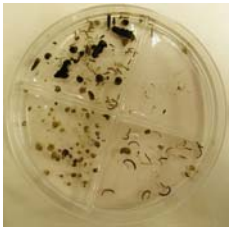
- In the Field, Bugs were hand picked.
- This pile of goop was then brought back to the laboratory and sorted through under the microscope.
- How many bugs did we miss?

# Bugs found					Total combined	Sorting Efficiency
Field	+	Laboratory	=			
189	+	415	=		604	31%
152	+	305	=		457	33%
169	+	296	=		465	36%
266	+	342	=		608	44%
226	+	235	=		461	49%
248	+	234	=		482	51%

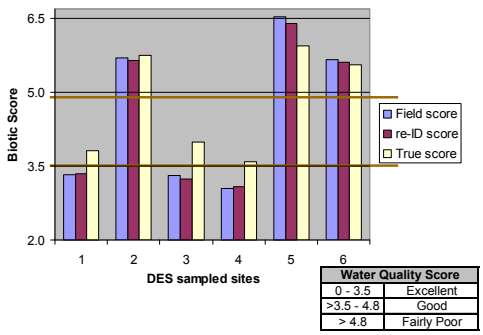


Bugs we found

Bugs we missed



How do Mid-ID's & Unsorted Individuals affect Biotic Score



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Summary: Recap of Test Year

- Generally Positive feedback from volunteer groups
- Protocol provided basic understanding of biological condition (we are not sure whether the #'s can be used to make impairment decisions. This requires further testing)
- Program logistics: equipment provisions/loaning, training sessions, data submittal
- NHDES testing useful in confirming volunteer feedback and sources of error.

Recommend Protocol changes

(Resulting from field use, QC efforts, & Volunteer feedback)

- Reduce sampling effort & specifically time to sort bugs
  - Standardize by "person-hours"

    Aim for >100 organisms in under 2 person-hours, with person-hours taking precedence over # critters
- Clump Caddisfly groups into one category
- Provide or encourage voucher collections to enhance bug identifications

Summer 2004 and beyond

- Finalize Protocols
- Maintain current Volunteer Groups (if willing)
- Increase Volunteers (based upon requests)
- Develop & Implement QC plan
  (Allowing for submittal of data to NHDES)
- Complete comparative analysis between VBAP & regular NHDES protocols

Thank you to all Volunteer Participants in the VBAP Pilot Year 2003

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